CLAIMS:

1. A method of processing acoustic data acquired at a receiver, the method comprising the steps: of processing the acoustic data to obtain at least a down-going component of a parameter of the acquired acoustic data; and using at least the down-going component of the parameter to identify the direct arrival at the receiver of acoustic energy emitted by a source.

2. A method as claimed in claim 1 and comprising the step of identifying, in the down-going component of the parameter, the direct arrival at the receiver of acoustic energy emitted by a source.

3. A method as claimed in claim 1 or 2 wherein the parameter of acoustic data is pressure.

4. A method as claimed in claim 3 and comprising determining the down-going component of the pressure from the pressure acquired at the receiver and from either the vertical component of the particle motion acquired at the receiver or the vertical component of the pressure gradient acquired at the receiver.

5. A method as claimed in claim 1 or 2 wherein the parameter of acoustic data is the vertical component of particle motion acquired at the receiver or is the vertical component of the pressure gradient acquired at the receiver.

6. A method as claimed in claim 5 and comprising determining the down-going component of the vertical component of particle motion from the pressure acquired at the receiver and from either the vertical component of the particle motion acquired at the receiver or the vertical component of the pressure gradient acquired at the receiver.

7. A method as claimed in claim 4, 5 or 6 wherein the vertical component of particle motion is the vertical component of particle acceleration.

8. A method as claimed in claim 4, 5 or 6 wherein the vertical component of particle motion is the vertical component of particle velocity.

9. A method as claimed in claim 3 or 4 wherein the step of determining the down-going component of the pressure comprises determining:

$$P^D = \frac{1}{2}\left(P - \frac{\rho\omega}{\sqrt{k_a^2 - k_x^2 - k_y^2}} v_z \right) \qquad (1)$$

where P is the pressure acquired at the receiver, v_c is the vertical component of particle velocity acquired at the receiver, ρ is the density of water, ω is the angular frequency of the acoustic energy, $k_a = \omega/c_a$ is the magnitude of the wavenumber for acoustic energy in the water, c_a is the velocity of acoustic energy in water, and k_x and k_y are horizontal wavenumbers.

10. A method as claimed in claim 1 and comprising processing at least the down-going component of the parameter of the acoustic data thereby to derive a further parameter of the acoustic data, and identifying in the further parameter, the direct arrival at the receiver of acoustic energy emitted by a source.

11. A method as claimed in claim 10 wherein the further parameter is the direct arrival wavefield.

12. A method as claimed in any preceding claim and comprising the further step of determining the path length of acoustic energy from the source to the receiver from the direct arrival of acoustic energy at the receiver.

13. A method as claimed in claim 12 wherein the source is spatially separated from the receiver, and wherein the path length of seismic energy from the source to the receiver is indicative of the separation between the source and the receiver.

14. A method as claimed in claim 12 wherein the source is proximate to the receiver, and wherein the path length of seismic energy from the source to the receiver is indicative of the range from the source and receiver to a reflector of acoustic energy.

15. A method of seismic surveying comprising: actuating a source of acoustic energy to emit acoustic energy; acquiring acoustic data at a receiver; and processing the acoustic data according to a method as defined in any of claims 1 to 14.

16. An apparatus for processing acoustic data acquired at a receiver, the apparatus comprising: means for processing the acoustic data to obtain at least a down-going component of a parameter of the acoustic data; and means for identifying the direct arrival at the receiver of acoustic energy emitted by a source, using at least the down-going component of the parameter.

17. An apparatus as claimed in claim 16 and wherein the means for identifying the direct arrival are adapted to identify the direct arrival in the down-going component of the parameter.

18. An apparatus as claimed in claim 16 and comprising means for processing at least the down-going component of the parameter of the acoustic data thereby to derive a further parameter of the acoustic data; and d, and wherein the means for identifying the direct arrival are adapted to identify the direct arrival in the further parameter.

19. An apparatus as claimed in claim 16, 17 or 18 and further comprising means for determining the path length of acoustic energy from the source to the receiver from the direct arrival of acoustic energy at the receiver.

20. An apparatus as claimed in claim 16, 17, 18 or 19 and comprising a programmable data processor.

21. A storage medium containing a program for the data processor of an apparatus as defined in claim 20.

22. A seismic surveying arrangement comprising: a source of acoustic energy; a receiver spatially separated from the source; and an apparatus as defined in any of claims 16 to 20 for processing acoustic data acquired at the receiver.

23. A ranging apparatus comprising: a source of acoustic energy; a receiver located proximate to the source; and an apparatus as defined in any of claims 16 to 20 for processing acoustic data acquired at the receiver.